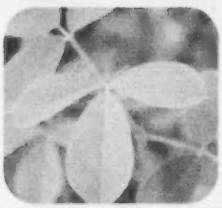

CROP TALK

Volume 14, Issue 3 OMAFRA Field Crop Specialists — Your Crop Info Source September, 2014

Table of Contents

1. Sulphur On Alfalfa
2. Picking Top Wheat Genetics?
3. I Have My Soil Test Results—Now How Much Fertilizer Should I Apply?
4. Cold Temperatures Hamper Soybean Nodulation
5. Can I Do Anything To Get Rid of Vetch Before Seeding Soybeans?
6. Pasture Opportunities
7. Pricing Corn Silage in 2014
8. The Trouble with P!

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Sulphur On Alfalfa

Joel Bagg, Forage Specialist & Bonnie Ball, Soil Fertility Specialist OMAFRA

Sulphur (S) received from atmospheric sulphur dioxide emissions (acid rain) in Ontario has steadily declined by over 50% during the last 25 years. We are beginning to see yield responses in more situations when applying S to alfalfa. Sometimes the response is dramatic, while in other situations there is no response. Tissue sampling of alfalfa is a useful diagnostic tool in predicting whether there will be an economic response to applying S.

S availability varies from site-to-site and from year-to-year according to temperature and rainfall. Soil organic matter plays an important role in providing available S to plants. Sulphate is very mobile in soils, similar to nitrate, and can be leached into the subsoil and become unavailable to plants (but not as easily as nitrate). S deficiencies have also increased due to some reductions in organic matter, and higher crop and protein yields. There is considerable S in manure. S deficiencies are more likely to occur on low organic matter soils, and soils that have not had a manure application within a couple of years. Within fields, sulphur deficiency symptoms may show up first on eroded knolls and other low organic matter areas.

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Ontario

What Does S Deficiency In Alfalfa Look Like?
Alfalfa has the highest S requirements of any of the field crops. A 4 ton/acre crop of alfalfa removes about 20 lbs/ac of S. S deficient alfalfa plants will be spindly and uniformly light green or yellowish (as opposed to a yellow top and green bottom, etc), with weak growth. (Figure 1)

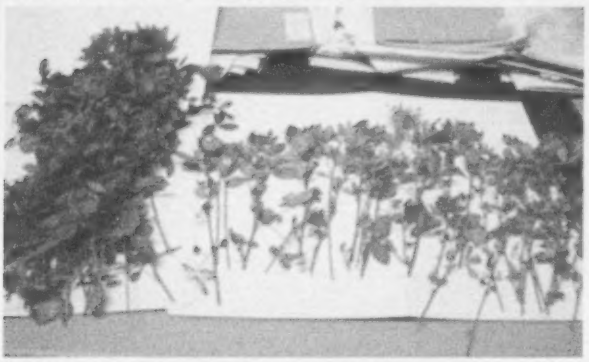

Figure 1 – S Deficiency Symptoms In Alfalfa. Left – normal alfalfa stems with tissue test 0.34% SRight – S deficient with tissue test 0.18% S, light green, spindly

How Do I Know If Have A Deficiency?
There currently is not a reliable soil test for S in Ontario. Sulphate levels are quite variable, and may be leached from the soil between soil sampling and plant growth. Tissue testing of alfalfa (at mid-bud to early-flower stage) is considered a suitable diagnostic approach for determining S deficiencies. Sample the top 6 inches of 35 stems and send them to a laboratory for tissue analysis. The critical level below which alfalfa is considered S deficient and may benefit from applying sulphur is 0.25%. If a check is desired, take a similar sample from an area with no visual S-deficiency symptoms.

A 2012 field survey of Ontario alfalfa stands indicated that 21% of fields had S- tissue analysis below this level. Put another way, 79% of these fields would have been unlikely to have an economic response to applying sulphur. It is also noteworthy that 37% of these fields tested below the critical K value of 1.7%, almost twice as many than were S deficient. Neglecting K fertility, while attempting to improve S fertility is not an effective strategy.

What Form of S?
What is the most economical source of S to use with alfalfa? The sulphur must be in the sulphate form to be taken up by the plant. Sulphate fertilizers include:

- ammonium sulphate (21 – 0 – 0 – 24)
- potassium sulphate (0 – 0 – 50 – 18)
- sulphate of potash magnesia (Sul-Po-Mag or K-Mag) (0 – 0 – 22 – 20)
- calcium sulphate (gypsum) (0 – 0 – 0 – 17)

All are equally effective as sources of sulphate. Depending on what assumptions you make, current prices make S in the sulphate form worth about $0.90 or more per lb S. To determine the most economical source of sulphate, get some local price quotes and do the math.

Ammonium sulphate provides nitrogen which should not be needed by the alfalfa. K-mag and potassium sulphate also provide potassium which is usually also required in alfalfa, but potassium sulphate is difficult to source and more expensive in some areas. Gypsum can be a good source of sulphate, but has no advantage in improving soil pH. Thiosulphate liquid forms, ammonium thiosulphate (12-0-0-26) and potassium thiosulphate (0-0-25-17), are readily available, but liquids are less convenient for fertilizing alfalfa and generally more costly per unit of S than dry forms.

Elemental sulphur (0-0-0-90) consists of finely ground sulphur that has been pelletized, and must be converted by oxidation to sulphate by soil bacteria before plants can utilize it. The rate of availability depends on particle size, method of application and moisture. Incorporating it into the soil before establishment makes it more readily available. In some circumstances, 50% of the sulphur maybe available in the year of application, while the remainder is more slowly available. Elemental sulphur is currently worth about $0.35 per lb S. Applying a single application of elemental sulphur rather than sulphate, supplies a cheaper S source over a longer period of time and reduces the need for annual applications. An application of 50 lbs/ac of S should last the life of a productive 3 year alfalfa stand.

When Should I Apply It?
Sulphate-S should ideally be applied in the spring at green-up to improve plant utilization, minimize losses due to leaching, and receive a first-cut yield boost (Figure 2). Elemental sulphur can be applied by:

1. incorporating it into the soil with other fertilizer at establishment (Figure 3) , or
2. blending it with P and K (and possibly boron) and broadcasting it after a cut.

How Much S Should I Apply?
A general thumb rule for S application on alfalfa is 5 lb/ac per ton of dry matter yield. Some S is still available in reduced amounts from atmospheric deposition and organic matter. The University of Wisconsin recommends 15 – 25 lbs/ac of S in the sulphate form broadcast on established stands annually, or 25 – 50 lbs/ac of elemental S incorporated at seeding. Research is required to verify these numbers in Ontario.

Ontario Research
Sulphur deficiencies in alfalfa have been more common in the mid-western US and north-western Ontario, because they are located upwind of much of the sulphur producing industrial pollution that has been cleaned up. Ontario research on sulphur rates, source, and timing for alfalfa has been more limited. Results from recent research trials applying sulphate to alfalfa have been mixed. Some sites have shown no response to applying sulphur. However, the most responsive site showed a dramatic yield increase in an alfalfa-grass mix of 1.55 ton/ac, a crude protein increase of 4 percentage points, and a percentage of alfalfa in the harvested forage improved from 33 to 56%.

To confirm that an actual yield response has occurred, farmers may want to leave a test strip where no S is applied. (Figure 4)

Figure 2 – Response of alfalfa to spring sulphate of potash (40 lbs S/ac) application, (left of stake)

Figure 3 – Response of alfalfa to elemental-S (100 lbs S/ac) broadcast in the fall previous to spring establishment (right of stake).

Figure 4 – Response from potassium sulphate applied to alfalfa following 1st cut.

Bottom Line
Tissue test alfalfa fields showing potential deficiency symptoms to determine if S should be applied, especially fields with low organic matter soils and those that do not receive manure. Applying elemental-S bulk blended with other fertilizer is the most cost effective method of providing S. Spring applications of sulphate can provide a more immediate yield response.

Picking Top Wheat Genetics?

Peter Johnson, Cereals Specialist, OMAFRA

The wheat variety trials, posted at www.gocereals.ca, are the best source of variety performance information. Pay particular attention to the "Managed Performance Trials" - Tables 1a, 2a, etc. These trials show the impact of fungicides on wheat varieties, so you can choose the best genetics based on your management level. There are always some additional questions.

Which winter wheat variety had the best survival?
It doesn't matter! In my 30 year career, the winter of 2014 was the first time ever for those severe winterkill conditions. The probability of a recurrence of this weather in 2015 is very small.

25R46 data is missing in Area 2?
Seed did not arrive in time for planting at Area II sites. Seed needs to be available so that planting can progress. We do not, and should not, hold up planting waiting on seed.

Which variety gives the most straw?
Straw yield data is very hard to come by. Area 5 is the only location taking straw yields. No, not all varieties are at that location.

There is SO much information!
Try using the "Head to Head" option on the website. You can pick your top 3 or 4 varieties, and see how they perform over years and areas.

Do I use Area 1, Area 2, or Area 1/2 combined?
While we break the data down, only Area 3 is really different, and in 2014 even Area 3 was not different. Using Area 1/2 combined gives the best indication of variety stability.

2014 data shows big differences to long term data?
Long term data is ALWAYS the best information to pick a winning variety. Use the most data possible with any given variety.

In an era of information overload, using this data is the key to growing the best wheat possible, or determining if premiums on any wheat type are high enough to make it worthwhile. Spend a few minutes on the website. It might just make the difference with who has bragging rights at the coffee shop next July!

I Have My Soil Test Results—Now How Much Fertilizer Should I Apply?

Bonnie Ball, Soil Fertility Specialist & Joel Bagg, Forage Specialist, OMAFRA

Why is it that you sometimes receive different fertilizer recommendations from the same soil test results? Agronomists and farmers may use different assumptions and objectives when determining how much fertilizer and manure to apply. The main approaches for determining fertilizer application rates from a soil test result include:

1. sufficiency; and
2. build-up (or draw-down) and maintenance.

Sufficiency Approach
The sufficiency approach rate is the most economic during the year of application. The value of the yield response is expected to pay for the cost of the fertilizer within that year. The sufficiency approach is designed to minimize the cost of fertilizer relative to yield within a given year. It requires frequent soil testing and annual fertilization, unless the soil test is high. It is most suitable for short-term decisions, including annual land rental agreements or limited cash flow. It is associated with a low risk of over-fertilization. Recommendations in OMAFRA Publication 75, *Agronomy Guide*, use the sufficiency approach.

Build-up & Maintenance
Sometimes also known as "target and maintenance" it is a longer-term approach that targets an ideal soil test value to meet the crop needs. Then over time, "builds-up" or

"draws-down" the soil test to this level and then maintains it.

1. For build-up of a low testing soil to target level, the rate is calculated by determining and adding:
    - the crop removal amount estimated from the expected yield, and
    - the additional fertilizer needed to increase the soil test to the target level over time.
2. Once in the target range, the soil test level is maintained by applying the amount removed by the crop.
3. Above the target level, no fertilizer is applied, allowing soil level to draw down to the target range.

Suggested target soil tests levels are 15 ppm P and 125 ppm K. Within ranges (12 - 18 ppm P, 100 - 150 ppm K) the recommended fertilizer rate for maintenance would be the same as crop removal. For suggested crop removal rates, refer to Table 9-14, Publication 811, Agronomy Guide http://www.omafra.gov.on.ca/english/crops/pub811/9manure.htm#table9-14

Above the target soil test ranges, no fertilizer would be applied until the levels are **drawn-down** into the ranges. Below the target soil test ranges, fertilizer amounts would be made by adding the removal rate amounts and an amount that will **build-up** the soil test level over time to the target level. Although the required build-up and draw-down amounts will vary from soil type to soil type, it is generally assumed for these calculations that to move a soil test (up or down) by 1 ppm, it is equivalent to:

- 35 lb/acre P_2O_5
- 20 lbs/acre K_2O.

The target and maintain approach is more suitable for owned land and long term leases. It provides long term returns from the investment in building soil test nutrient values into the optimum range. It is associated with some risk of over-fertilization. Regular soil testing is required to verify that crop removal and soil test response estimates are reasonably accurate. The length of the build-up time (eg. 1 - 8 years) will determine how the cost will be amortized. Also, this approach provides some financial flexibility by:

- deferring fertilizer purchases to when cost is lower relative to crop revenue
- more application during years with crops more responsive to freshly applied fertilizers or when efficient fertilizer application is more feasible (such as use of equipment capable of sub-surface placement).

Example Calculations Using the Build-up Approach
Assume a soil test of 10 ppm P and 90 ppm K.

Target soil test

- 15 ppm P
- 125 ppm K

Build-up amounts:

- Assuming a 5 year build-up period

Crop removal rates (maintenance) of 40 bu/ac soybeans

- 40 bu/ac X 0.84 lb P_2O_5/bu = **34 lb/ac P_2O_5**
- 40 bu/ac X 1.4 lb K_2O/bu = **56 lb/ac K_2O**

	Desired change in soil test (ppm)	Total nutrients to build-up to target (lb/ac)	Annual nutrient rate for build over 5 yr (lb/ac/yr)
	[target – actual]	*[soil test ppm change X nutrient addition per change in ppm]*	*[total nutrient , # years]*
P	15 –10 = 5 ppm	5 ppm X 35 lb P_2O_5/ ppm=175 P_2O_5	175lb P_2O_5/ ac ÷ 5 yr = **35 P_2O_5**
K	125 –90 ppm = 35 ppm	35 ppm X 20 lb K_2O/ ppm=700 K_2O	700lb K_2O/ ac ÷ 5yr = **140 K_2O**

Fertilizer Application Rates (during the soybean year)

- total of maintenance + build-up amounts
- **P_2O_5** 34 lb/ac + 35 lb/ac = **69 lb/ac**
- **K_2O** 56 lb/ac + 140 lb/ac = **196 lb/ac**

Cold Temperatures Hamper Soybean Nodulation

Horst Bohner, Soybean Specialist, OMAFRA

The 2014 growing season was the worst year in recent memory for poor root nodulation and nitrogen (N) fixation in soybeans. Cool, wet conditions cause numerous problems, including slow growth, low pod set, increased diseases, and lower yields. One significant problem that may be overlooked is that cool soil temperatures will delay or even inhibit nitrogen fixation.

Soybeans are a subtropical species. For optimal symbiotic activity the soil temperature should be between 25 - 30°C. There were numerous first time fields where inoculant was applied, but nodulation did not occur. In other cases, nodulation did occur but not until early-August. Problems with poor nodulation happened across a wide geography and occurred with several different inoculant products, so it was not a product failure. In a few cases, even second time soybean fields failed to nodulate properly. Biological nitrogen fixation is essential for both first time fields and fields with a history of soybeans, because it converts gaseous nitrogen in the air (N_2) to a form of nitrogen the plant can use.

How Does Nodulation Occur?
Soybean plants secrete chemical signals (flavanoids) into the soil from the roots when the plant needs nitrogen. These signals are picked up by the rhizobia, which in return send a chemical signal back to the root. The signals sent back are called Nod factors and elicit nodulation in the plant. Within 10 - 14 days of colonization, a nodule will become visible. The return signal prepares the root for infection by the bacterium. Infection can only occur where root hairs are present. The Nod factor causes root hairs to curl and pick up rhizobia and allows them to invade the root. As the bacterial cells divide, they form a small tumor like structure called a nodule.

Why Was Nodulation Poor This Year?
There are a number of factors that influence nodulation, nodual growth, and nitrogen fixation. These factors include too much or too little moisture, soil nitrate levels, soil pH, diseases, organic matter, soil temperature, and rhizobial quality.

This year, cool temperatures are to blame for poor nodulation. In some cases, soil conditions also turned dry immediately after seeding causing the bacteria to dry out and die before they could invade the roots.

Experiments conducted at McGill University by Zhang, Lynch, and Smith [1] showed that between 17 - 25°C the onset of N_2 fixation was delayed by 2.5 days for each degree decrease in temperature. Below 17°C each degree delayed the onset of N_2 fixation by 7.5 days. A root zone temperature of approximately 15-17°C seems to be the critical temperature for soybean nodulation and N fixation. By 49 days after inoculation plants at temperatures between 17 – 25°C were fixing some nitrogen, but plants at 15°C were not fixing any nitrogen. They also observed that a decrease of only 2°C from 21°C to 19°C made an important difference in the time to onset of N_2 fixation, total N accumulation within the plant and overall growth.

Matthews and Hayes [2] showed that nodulation can cease when temperatures fall to 10°C. Lynch and Smith [3] showed that a root zone temperature of 15°C restricted both infection and nodule development and delayed the onset of N_2 fixation by 4-6 weeks. Plants with a root zone temperature of 15°C had only fixed 9% of the nitrogen fixed by plants at 25°C 6 weeks after inoculation.

This helps us understand why in some cases soybeans did not nodulate until late-July or early-August this year. No-till fields, especially those with large amounts of crop residue, also suffered more from a lack of nodulation because these soils are generally cooler by a few degrees C.

Soil Nitrate and N Fixation

High nitrate levels also caused some problems. Nodule formation is inhibited by the presence of high nitrate levels in the soil. If the soybean plant picks up too much nitrogen early in the season, it will delay or prevent nodulation. The reduction of atmospheric N_2 to ammonia is energetically expensive, and costs more photosynthate than simply taking up nitrate, so the plant will naturally consume nitrates before attempting to nodulate. This fundamental inability to develop and sustain N_2 fixation in the presence of soil nitrates at greater than very small "starter" fertilizer rates is one of the reasons why nitrogen fertilization does not pay in soybeans. Applying nitrogen fertilizer simply reduces the amount of N_2 fixed from the air.

What about Next Year?

Temperatures in Ontario in June and July are generally sufficient for proper nodulation, so under average conditions this problem will not be significant. In first time soybean fields, use two inoculant products such as a peat and a liquid at the high rate with good coverage. Some first time fields that used only one product or a pre-inoculant had complete nodulation failures in 2014. Using two products will help to increase the number of live bacteria available for nodulation. It is also essential to consider the bacterial viability with pesticide seed treatments. The only remedy to a nodulation failure is to apply N fertilizer at first flower or early pod set.

1) *Zhang F, Lynch D. H, and Smith D.L. (1995) Impact of low root temperatures in soybean on nodulation and nitrogen fixation. Env. And Exp. Botany, Vol 35, no3 pp. 279-285.*

2) *Matthews D.J. and Hayes P. (1982) Effect of root zone temperature on early growth, nodulation and nitrogen fixation in soya beans. F. Agric. Sci 98, 371-376.*

3) *Lynch D.H. and Smith D. L. (1993) Soybean nodulation and N2 fixation as affected by period of exposure to a low root zone temperature. Physiol. Plant. 88, 212-220.*

Can I Do Anything To Get Rid of Vetch Before Seeding Soybeans?

Mike Cowbrough, Weed Specialist, OMAFRA

Tufted vetch (Viccia cracca) is a weedy perennial legume that is difficult to manage in cropping systems that use reduced tillage, and particularly when annual legume crops are grown, such as soybeans.

Tufted vetch also exhibits high tolerance to many herbicides, most notably glyphosate. A rate response study was conducted by the University of Guelph over a decade ago and it took 3 times of the normal rate of glyphosate to provide over 80% visual control. Observations made by growers and agronomists are consistent with the public research. Glyphosate applied at rates typically used for pre-plant burndown applications in soybean do not control tufted vetch. (Table 1)

Table 1. Visual control of tufted vetch when applied with different rates of glyphosate

Herbicide and Rate	Visual Control (%)
Glyphosate (540 g/L) at 0.67 L/ac	57
Glyphosate (540 g/L) at 1.34 L/ac	72
Glyphosate (540 g/L) at 2 L/ac	85
Glyphosate (540 g/L) at 2.68 L/ac	98

If tufted vetch is not adequately controlled before planting, there aren't any effective herbicides to manage it once the soybeans have been planted. A summary of the most effective herbicide programs used in non-GMO soybeans over three years is shown in Table 2.

Table 2. Visual control of tufted vetch after applications of herbicide programs used in non-GMO soybeans.

Treatment (application timing)	Visual Control (%)
Boundary (PRE) followed by Reflex + Pinnacle + Non-Ionic Surfactant (POST)	74
Broadstrike RC + Boundary (PRE)	67
Dual II Magnum + Sencor + Lorox (PRE)	62
Pursuit + Valtera (PRE)	59
Conquest + Valtera (PRE)	52

Cause for optimism in 2014 research trials?

A number of pre-plant burndown treatments that targeted some perennial weeds, including tufted vetch, were evaluated in 2014. At 2-4 weeks after application there were a couple of very impressive treatments, specifically when either flumioxazin (found in Valtera, Step-Up, Fierce and Guardian

Plus) or saflufenacil (found in Eragon, Integrity and Optill) were mixed with glyphosate and the adjuvant, Merge. Although these treatments provided impressive burn of any emerged vetch at 4 weeks after application, the vetch did grow back at 8 weeks after application. However, there was an unexpected silver lining in this trial. The addition of 2,4-D ester 700 in burndown treatments, although unimpressive at first, provided better control of vetch than any other treatment at 8 weeks after application. Bottom line - 2,4-D ester 700 applied pre-plant in soybean looks like a promising tool for the control of vetch in soybeans provided the vetch has emerged at the time of application. More trial work will be needed to verify the consistency of these results, but if you struggle with this species on your farm this might be a treatment worth experimenting with.

Figure 1 - Vetch pressure in a plot where the burndown treatment was ineffective at controlling vetch.

Figure 2 - Vetch control at 8 weeks after a pre-plant application of glyphosate + 2,4-D Ester 700. Glyphosate was applied prior to soybean flowering to remove any late emerging weeds.

Figure 3 - A look at the level of vetch control under the crop canopy when 2,4-D ester was used in the pre-plant burndown.

An Important Point

I'm choosing to show you the results of one trial with optimistic results so far. I'm doing so because this is a species that more growers struggle with and there aren't currently many options. It is important to keep in mind that for a weed to be listed as controlled on a herbicide label, a minimum of 10 replicated trials conducted over 2 growing seasons must be provided. This provides a level of assurance that the herbicide will perform on the labeled species. One trial may be a fluke, we won't know until this is replicated several times. Therefore expectations for control of tufted vetch with these treatments at this point should be low.

Pasture Opportunities

Jack Kyle, Pasture Specialist, OMAFRA

Beef cow inventories in Ontario, Canada and the world are currently down significantly, and there is no sign of a rebuild in numbers starting yet. This has resulted in the value of beef calves and stockers being at an all-time high. Calves selling at $3.00/lb represent $1,200 - $1,500 gross return on a cow. This is twice the average from the last few years.

Grazing is about growing grass. The more grass forage that is produced on a parcel of land, the more cattle that can be supported on that acreage.

Managing a pasture is about rest and recovery of the grass. If livestock have access to all the pasture area, they pick the tasty plants and leave the less palatable and more mature plants. The most palatable plants get over-grazed and the less palatable get under-grazed. Palatability is affected by maturity as much as species.

Subdividing Pastures & Rotational Grazing

Rotational grazing is the key to getting even pasture consumption across the pasture. Animals should be in a pasture / paddock for no more than 5 days. For optimum production a paddock should be grazed 1 - 2 days, followed by 25 - 45 days or more for recovery and re-growth.

In my years as provincial grazing specialist, I have seen significant improvements in pasture productivity simply by sub-dividing a pasture. In most cases, an increase of 25 - 35% in productivity is readily achieved. In very dramatic cases, a 500% increase has been seen.

Since your pastures already have a perimeter fence, sub-dividing to increase productivity is very simple. An internal sub-division fence can consist of one electric wire (2 at the most) with step in posts. Animals quickly learn that the fresh grass available when they are moved is far more palatable than the grass that has been trampled and fouled by manure and urine. See video Rotational Grazing In Ontario at: http://www.youtube.com/watch?v=lvE3sylXd0E

Each paddock must have easy access to water, but since several paddocks can access the same water point, this does not need to be a daunting task. One fairly easy way of getting water where it is needed is by pumping it through plastic pipe lying on the ground.

Grazing Cover Crops

There is another opportunity for pasture in cover crops. Cover crops grown for soil protection can double as livestock pastures. The livestock will benefit from the cover crop forage, and also convert the nutrients in the cover crop into a more readily available form for the succeeding annual crop. This additional feed will give your permanent pastures an opportunity to rest and recover and will result in strong plants for next year's grazing season.

Look around your farm and your community and see if there are crop acres that are better suited to perennial forage, or are already producing perennial forage but could be more productive. I think you will be able to find some opportunities to increase your livestock productivity and the productivity of the available pasture lands. Rotational Grazing In Extensive Pastures available at http://bit.ly/M7M1kE provides a number of options.

There are many opportunities to increase the productivity of existing pasture land and also grazing of other crops. This will provide low cost feed for livestock and allow the producer to realize increased profitability in their farm enterprise.

Pricing Corn Silage in 2014

Joel Bagg, Forage Specialist & Greg Stewart, Corn Specialist, OMAFRA

"What's corn silage going to be worth this year?" Corn development is delayed for a significant portion of the crop and could be at risk of frost. Farmers may be looking at salvaging frost damaged corn that hasn't matured adequately for optimum yield, moisture or quality by harvesting or selling some of those fields for silage. Silage piles and silage bags can provide flexible storage options. Local supply and demand and negotiation between buyer and seller ultimately determines the price. It is important that you make your own assumptions for your situation and calculate your own costs, in order to determine what you feel is an acceptable price. Then negotiate the best you can.

Forage Quality Of Frost-Damaged Immature Corn Silage

Buyers need to consider the nutrient quality of frost-damaged corn silage. Frost damaged corn silage will have a lower grain-to-stover ratio. Use wet chemistry laboratory analysis, and newer measures (including crude protein, NDF, fibre digestibility, starch, ash and fat) to more accurately estimate corn silage digestible energy.

Slightly immature, frost damaged corn that has dented can make good silage. In general, this will have slightly higher fibre and crude protein and slightly lower energy levels than normal corn silage. Quality may not be optimum for high producing dairy cows, and it is sometimes a good idea to consider harvesting the better corn fields for silage. Very immature corn silage at the milk or early dough stages will have lower starch and higher fibre levels. This can be fed to animals with low to moderate energy requirements, such as beef cows and stockers. Additional grain can be more easily included in feedlot rations to increase the energy content.

Harvesting Frost-Damaged Corn Silage

Harvesting at the proper whole-plant moisture is critical for producing quality corn silage. Harvesting frost damaged corn silage too wet is the most serious problem. At moisture greater than 70%, clostridial fermentations produce butyric acid, resulting in high fermentation losses, lower intakes, ketosis and poor cow performance. Refer to "Frost Damaged Corn Silage" http://fieldcropnews.com/?p=8004 and OMAFRA Factsheet 13-051 "Harvesting Corn Silage At the Right Moisture" http://www.omafra.gov.on.ca/english/crops/facts/13-051.htm.

Example Calculations

One method to determine the price of corn silage is to compare it to the value of grain corn to determine a minimum price. As a seller, you would not want to sell it as corn silage for less than you could net selling it as grain. Buyers feeding corn silage to livestock might be prepared to pay more, depending on what alternate feedstuffs are available. From a livestock nutrient point of view, corn silage may be worth more in the ration than is reflected in the market.

These calculated corn silage values are not necessarily the cost of production, or the feed nutrient values, but reflect the market value of the alternate harvesting options (ie. harvesting as grain corn).

Tremendous variation in yield and quality can occur between fields. Higher yield reduces harvesting costs per tonne. Higher yielding corn fields also contain a higher proportion of grain relative to stover, usually making them greater in digestible energy. A "thumb rule" is 7.7 bushels grain per tonne (7.0 bu/ton) of silage at 65% moisture for a good crop. As an example, refer to Table 1, Pricing Corn Silage Example Calculations. Example #1 has good yield, while the frost-damaged corn in Example #2 yields about three-quarters of that.

The expected grain value should be adjusted for custom combining, drying, and trucking charges to give a value of the crop in the field. The additional soil nutrient value (P and K) removed in the non-grain portion of the silage (stover) is significant, at about $3.50 per tonne of corn silage harvested (@ 65% moisture). Calculating the cost per lb or tonne of dry matter can help put corn silage in perspective relative to what the market is willing to pay for standing hay. If the seller is going to fill the silo for the buyer, custom silo filling charges should also be added. Storage costs, fermentation shrink and spoilage losses are not included. Refer to:

> Guide to Custom Farmwork and Short-Term Equipment Rental
> http://www.omafra.gov.on.ca/english/busdev/facts/10-049.htm
> 2014 Field Crop Budgets
> http://www.omafra.gov.on.ca/english/busdev/facts/pub60.htm.

Percent moisture will have a significant impact on price, so it is important to sample and get reliable moisture numbers. Nobody wants to pay for water when they think they are buying feed. An error of only 5% moisture (ie. estimating 65% when it is actually 70%) is equivalent to almost $4 per tonne.

Other Considerations

The local supply and demand of corn silage and alternate forages will influence the price. The availability of silage storage and the economics of feeding are considerations. Sellers with a potential Crop Insurance claim should contact Agricorp (1-888-247-4999) before harvest to determine how selling corn as silage will impact the claim. Good yield and quality estimates are important and should take into consideration actual weights and percent moisture. The removal of the stover organic matter could be considered as well.

Table 1 - Pricing Corn Silage Example Calculations

	Example #1 "normal"	Example #2 "frost damaged"
Assumptions		
estimated grain yield tonnes / ac bushels / ac	 4.190 165	 3.175 125
bushels grain (15.5% moisture) per tonne silage (65% moisture)	7.7	6.4
corn silage yield (65% moisture) tonne / acre	21.43	19.53
grain price (fall delivery, local) #2 grade #5 grade	$155.50/T ($3.95/bu)	$143.00 ($3.63/bu)
Calculations		
gross grain value / acre (grain yield X price)	651.54	454.03
- drying 26% moisture @ $24.02 / tonne 30% moisture @ $30.71 / tonne	-100.64	-97.50
- combining	-40.00	-40.00
- trucking (@ $9.00 / tonne)	-37.71	-28.58
= gross value / acre before grain harvesting costs	473.19	287.95
+ extra P & K removed in stover (~$3.50/tonne of corn silage @ 65% moisture)	+75.01	+68.36
Value Standing		
per acre	548.20	356.31
per tonne silage (65% moisture)	**25.58**	**18.24**
$ / tonne dry matter	73.09	52.13
¢ / lb dry matter	3.3	2.4
+ silo filling $240/hour, 2.5 acres/hour $240/hour, 3.0 acres/hour	 +96.00	 +80.00
Value Harvested		
per acre	644.20	436.31
per tonne silage (65% moisture) (before fermentation shrink, spoilage & storage costs)	30.06	22.34

The Trouble with P!

Bonnie Ball, Soil Fertility Specialist & Ian McDonald, Applied Research Co-ordinator OMAFRA

Everyone in agriculture knows that phosphorus (P) is important to plant and animal growth. It is one of the essential, or macro nutrients. Plant P is part of the complex nucleic acid structure (DNA, RNA, etc) involved in protein synthesis, cell division and the production of new tissue. It is also part of the many complex energy transformations within plants - remember "ATP" from high school biology. Photosynthesis and plant growth cannot occur without adequate amounts of P.

The amount of P (or any nutrient) that we apply in agriculture is small in terms relative to the amount of soil. The total P concentration in crops is generally between 0.1 and 0.5% of dry matter. The overuse of large numbers in society reduces our realization of the magnitude of numbers. We talk about "ppm's" of nutrients without giving much thought to how small this is. As a calibration, consider that we are typically adding 50 to 100 pounds of P_2O_5 to an acre of soil (22 - 44 lb/ac actual P). In an acre of soil 6 inches deep (the depth we sample for nutrient laboratory analysis) there is 2,000,000 pounds of soil. We are adding 0.005% of the weight of the soil.

Algae Growth

So, P applied to soils is critical to plant growth and is a very small amount relative to the total amount of soil. So what's the problem? Well, as important as P is to plants in small amounts, it is very active at even smaller amounts with species such as algae. When there is a large source of P in a body of water, algae populations explode, causing large and often toxic algae blooms. (Figure 1)

Figure 1 - Algae growth can be seen in this satellite shot of Lake Erie.

You Can't Manage P Without Soil Testing

Loss of P from fields into surface waters of a mere 1 lb/ac (2.3 lb P_2O_5) can change the aquatic community. Algae blooms are a reality. The largest non-point source of P leading to those blooms is coming from agriculture. Despite talk about stagnate P fertilizer sales, lower soil test P levels, and reduced livestock numbers, we have seen an increase in algae growth in Lake Simcoe, Lake Erie, and the Gulf of Mexico. Although soil test P levels seem to be generally declining, there are still significant numbers of fields with high test values that continue to receive more fertilizer P than required. The only way to adequately know this and be able to make knowledge-driven rate decisions is through soil testing. Soil testing is an essential part of crop management.

Farming Practices That Contribute To P Loss

Some farming practices that contribute to P losses from soils include aggressive tillage, fall broadcast fertilizer often without incorporation, larger fields creating the potential for more overland flow runoff and erosion, and the loss of forage and cereal acres. Variations in weather patterns, including more freeze/thaw cycles, less frequent but more intense rain events, and warmer temperatures are also resulting in much more soil loss from the farm landscape.

P leaves the farm field in one of 3 ways:

1. wind erosion, where P is attached to soil particles that move in the wind
2. overland flow water erosion, where P-attached soil moves with water, and
3. as dissolved P, in both overland flow and tile drain water.

The majority of P loss is occurring during the non-growing season portion of the year (Figure 2). Therefore farming practices that leave soils unprotected during these parts of the year are the major cause of the P losses.

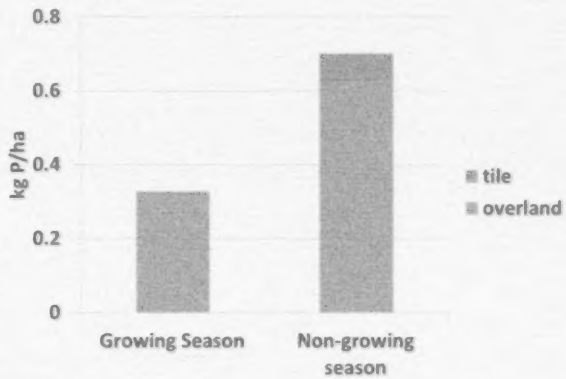

Figure 2 - 70% of annual total P movement occurred during the non-growing season (Ball Coelho, Murray, Lapen, Topp, Bruin. 2012. Agricultural Water Management 104:51)

How Important Is Dissolved P?

In some systems, such as where phosphate fertilizers or manures are broadcast on the soil surface, much of the P transported to surface waters is in the dissolved, "highly bio available" form. However, where fertilizer or manure is banded below the surface, the contribution of dissolved P is less important. In a study near London Ontario, 18% of total P movement in tile drainage plus overland flow was in the dissolved form. (Figure 3)

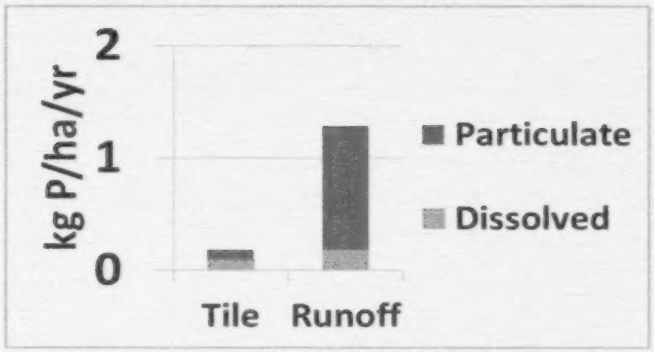

Figure 3 - Partitioning of dissolved and particulate P in tile drainage and overland flow. (Ag. Water Management 104:51).

P Loss Indicates Soil Loss

Farmers should also be concerned about P loss because it indicates a loss of soil from our fields. While the 1 lb/ac loss of P may seem insignificant, the associated soil loss is not. Assuming that total P (all forms of P) in a soil is 500 ppm (average for temperate soils), then 1 lb/ac P is equivalent to 1 ton/ac of soil.

We are losing a substantial amount of soil that will reduce our long term ability to have sustainable crop production. In the short term, soil loss has financial implications with loss of nutrients (not just P) which have to be replaced, and yield loss. At some point, soil losses will limit the yield potential of the genetic gains. Compromised soils will not have the water and nutrient holding capacities necessary.

Practices that reduce tillage, variably apply nutrients through targeted and directed application methods, utilization of overwintering cover crops (preferably alive but also undisturbed dead), more crops in the rotation, maintaining adequate amounts of residue cover and residue returned to the soil, installation of water control structures (grassed waterways, buffer strips, permanent berms, etc) can all contribute to reduced soil losses, healthier soils, greater yield and more profit. This will also be confirmed by reduced algae blooms in our lakes.

Reference

Ball Coelho, B., Murray, R., Lapen, D., Topp, E., Bruin, A. 2012. Phosphorus and sediment loading to surface waters from liquid swine manure application under different drainage and tillage practices. Agricultural Water Management 104: 51-61.

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